

DOCUMENT RESUME

EM 009 002

ED 051 651

AUTHOR Allison, V. M.; Sperry, Frederick E.
 TITLE The Dynamics of Microfilm.
 INSTITUTION Wisconsin Univ., Milwaukee.
 PUB DATE [71]
 NOTE 42p.

EDRS PRICE MF-\$0.65 HC-\$3.29
 DESCRIPTORS Academic Records, Automatic Indexing, *Computer
 Output Microfilm, Confidential Records, *Data
 Processing, Information Storage, *Input Output
 Devices, Microfiche, *Microreproduction,
 Recordkeeping, *Student Records
 IDENTIFIERS *University of Wisconsin Milwaukee

ABSTRACT

In the computer output microfilm (COM) process, machine language on magnetic tape is converted via electronic equipment into print on microfilm. At the University of Wisconsin-Milwaukee, COM is being used increasingly to reduce the volume of hardcopy files, to permit efficient record retrieval, and to provide protection for the files from fires and other hazards. In their first use of COM, the Office of Admissions and Records used the process to improve their handling of student records. With COM they were able to go from a punch card for each of their 21,000 students to an entire student study list on two rolls of 16 millimeter microfilm. As other departments became interested in the process the system was changed to COM microfiche, indexed and titled by computer. Low-cost microfiche readers were installed around the campus and the Office of Student Affairs, the University Health Center, and the Student Loans Office became constant users of the microfiche service. COM has totally replaced hardcopy in a number of uses at a great savings in time, space, and money. Based on their success with COM the authors suggest methods of beginning and/or expanding a COM system. They point out several areas of great potential for this process, review recent improvements in COM technology and equipment, and describe the benefit of COM in data processing. (JY)

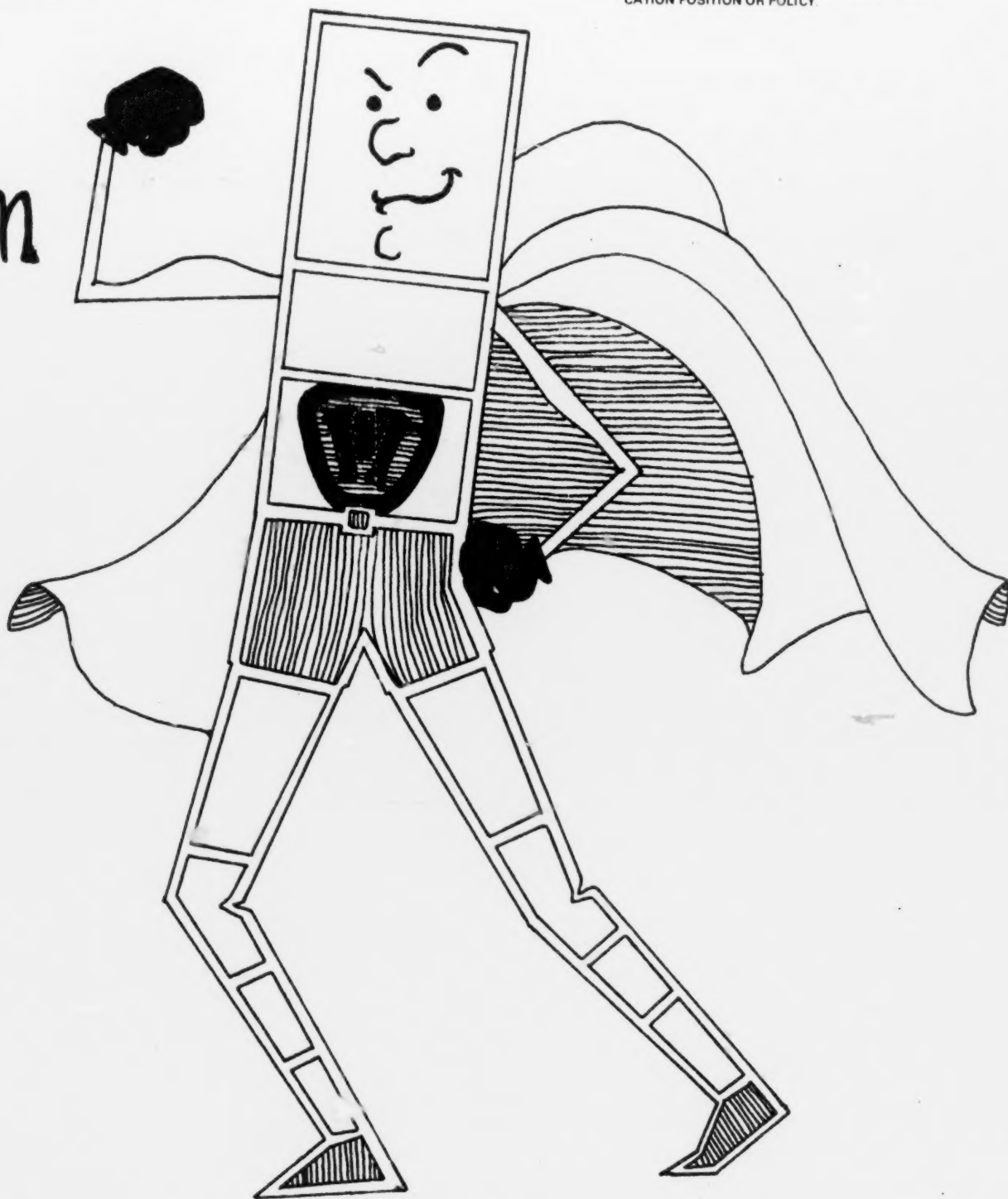
The Dynamics of Microfilm

ED051651

U.S. DEPARTMENT OF HEALTH, EDUCATION
& WELFARE

OFFICE OF EDUCATION

THIS DOCUMENT HAS BEEN REPRODUCED
EXACTLY AS RECEIVED FROM THE PERSON OR
ORGANIZATION ORIGINATING IT. POINTS OF
VIEW OR OPINIONS STATED DO NOT NECES-
SARILY REPRESENT OFFICIAL OFFICE OF EDU-
CATION POSITION OR POLICY.



Presented By:

V. M. Allison
Registrar & Director of Admissions

Frederick E. Sperry
Associate Director
Office of Admissions & Records
University of Wisconsin-Milwaukee



EM 009 002

The focus of this discourse is on microfilm as a versatile tool that can assist you, registrars and admissions officers, in one of your important responsibilities--records and information management. We plan to use about two-thirds of the time for show and tell, the rest for questions and answers.

First, in this introduction I will explain our concept of microfilm as a means for managing current information. This will lead to the second part of our presentation, a slide-tape narrative/explanation of Computer Output Microfilm at our University. Following the slide-tape, Fred Sperry and I will answer questions you may have.

After a few minutes for questions, Mr. Sperry will present our third topic, "The Now-Potential of Microfilm". Then, if time allows, we have a fourth topic, "Beginning and Expanding Uses of Microfilm". Your questions will have priority. We will cut our prepared material short if need be. We have copies of it if you want one.

We chose our title, "The Dynamics of Microfilm", because we believe that micrography as equipment, procedure, and product is here and now a means for radically improving records and information management. In the 60's the computer greatly affected all of us. In the 70's micrography may have nearly as great an impact.

In Milwaukee our student information file begins with data from a student's admission form, his test scores, and records of previous academic work. Yours too? For each student who registers we maintain a current record, and we develop his permanent academic record. So do you? We enter the work of each term on his permanent record, and we

consider the record to be active so long as the student enrolls. You do too. When the student leaves, we consider his record to be inactive--as you do.

Our initial interest in microfilming arose out of concern for the increasing need for file space for inactive records. Quite early in our planning, however, we concluded that file security is so important that we decided to begin microfilming updated active permanent records first. After getting one copy of our PRC file safely stored in a vault, an incidental mixture of problems--office space, housekeeping, and personnel--led to our active use of the other copy. For one thing, we learned that a senior summary can be prepared from a microfilm image. That was about four years ago. Since then we have expanded our uses of microfilm, and we are now using it for several applications, two of which replace hard-copy records altogether.

We believe that microfilm and micrography can be used to facilitate all of our records procedures from admissions to archives. And yours too. This is the main idea of our discourse--a theme we will repeat implicitly and explicitly in a variety of ways: micrography and microfilm merit your consideration as a means to reduce or eliminate paperwork pile-up and to enable you to give better service to your college or university; and to do so with little or no increase to your budget. The future is equally promising. Micrographics may soon make it possible for computer people to keep their promises.

Many people think of microfilm as a means for reducing and storing large volumes of inactive information. This is a passive use, no

matter how beneficial. Microfilm can and has served active uses. One such use served literally millions of servicemen and their families during World War II. Do you remember the V-Mail letter, or have you ever heard of it? It was the product of a microfilm procedure that can be compared to some we still use today. V-Mail began with the letter an overseas serviceman wrote on special stationery. The letter was filmed, and the film was flown back to the states. A hard-copy print of the letter at about 50% reduction was then mailed home.

The primary difference between the V-Mail system and a microfilm system for inactive records is the airplane trip. V-Mail was used to solve a distribution problem, and reduction of volume made it all feasible. Once the film was printed in hard-copy in the states, it was done. In contrast, we want to keep our inactive records, and we assume that reproduction and distribution will be occasional rather than frequent or constant. We would be reluctant to microfilm records if we could not reproduce them, for this makes space saving and file security feasible.

Although we may wish that an inactive record would stay inactive, we remain acutely aware as registrars and admissions officers that we have responsibility for distribution of information, especially about active students with active records. For the last five or six years we have looked to third and fourth generation computers to help us. Indeed, some of you have installed cathode ray tube and other types

of remote computer terminals as a means of information distribution.

The computer has had dramatic impact on us all. In a period of concern for the environment, the computer is a prime paper polluter. One of this country's large manufacturers employs 40,000 people and produces two box car loads of paper daily from its computers. If each of the 40,000 employees speed read this hard-copy output 8 hours per day, they would get through 5% of the output. The Federal Government's 2600 computers spew forth enough paper annually to reach 2000 miles high.

The hard-copy computer printouts cause space problems. There is always a question of the security and integrity of a hard-copy file. Information in hard-copy form is slow to retrieve and its distribution is slow and expensive. The cost of reproducing hard-copy is high and the quality of carbon copies is poor.

Another problem that has plagued computer users is the speed of computer printers. Generally the computer is bound by the speed of its printer. As the speed of the printer is usually 1/15 of that of the computer, the expensive computer sits idle during most of the printing cycle.

In the 1960's the computer and microfilm industries were brought together with a process called Computer Output Microfilm or COM. COM is both a process and a product. In the process machine language on magnetic tape is converted via electronic equipment into human readable language onto microfilm. The product that results is a 16 mm, 35 mm,

or 105 mm microform. In other words COM is a conversion process that allows going from magnetic tape to microfilm without going through the hard-copy stage.

Two components are needed to create COM microforms -- a properly formatted magnetic tape and a COM unit which consists of a film camera and usually a Cathode Ray Tube.

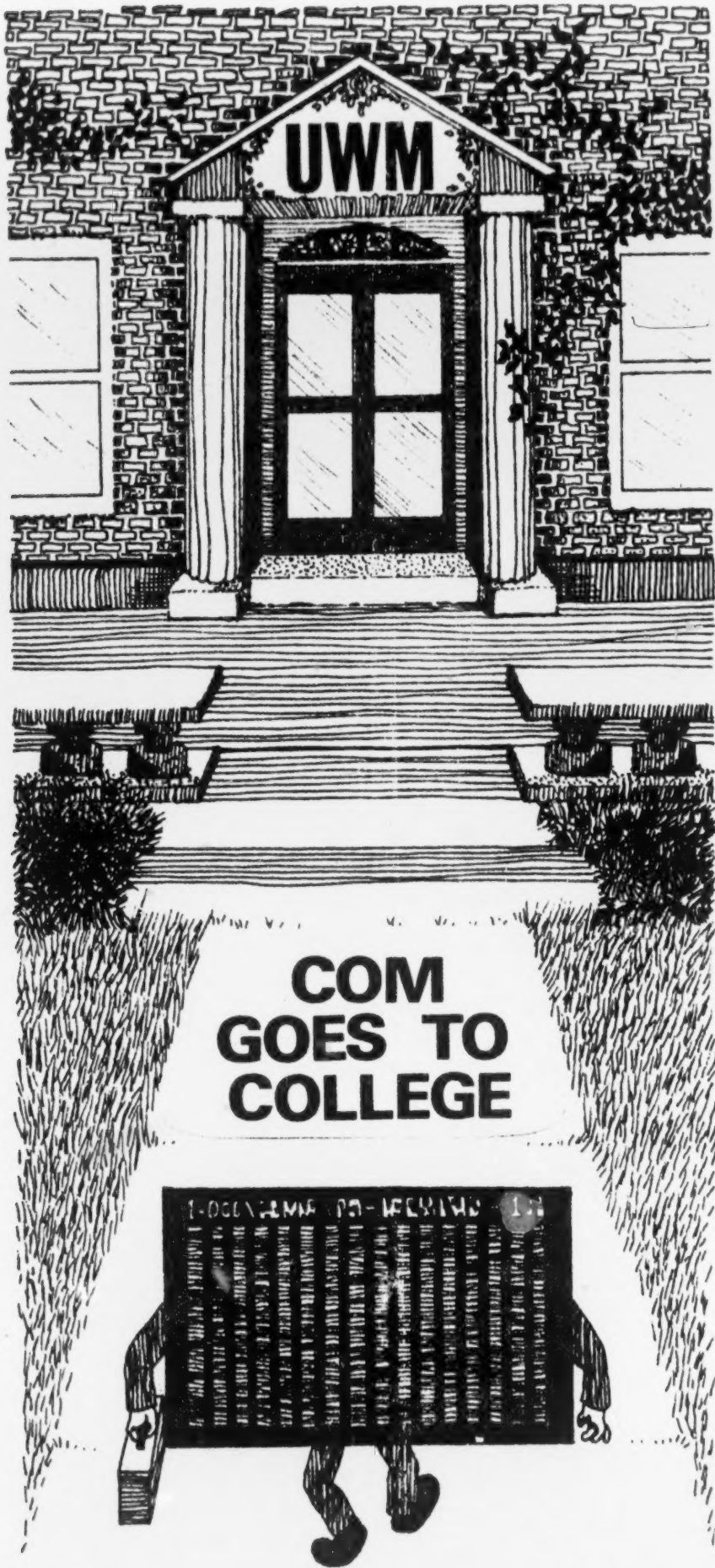
COM is intended to replace conventional paper output thus eliminating the purchasing and use of expensive carbon-interleaved forms and the time necessary for decollating and bursting these forms. COM output onto film is fifteen to twenty times faster than a computer impact printer.

The pioneers in developing Computer Output Microfilm are companies with little public reputation for either photography or computers. To this day Eastman Kodak is not the big name in COM processors. Neither is Bell & Howell or 3 M. Can you imagine IBM being so content with its unit records equipment that it did not develop a computer. Some such analogy applies to development of COM and helps to explain why it has not been as aggressively marketed as computers.

COM is about 12 years old but only in the last two years has acceptance and use boomed in business and industry. Our first knowledge of COM came in early 1967 when we were investigating conventional microfilm systems. We paid little attention to COM at that point because COM equipment was too expensive to consider purchasing and service bureaus in our area were just beginning to blossom. Besides we felt COM was too sophisticated for our operation.

In September 1969 Fred Sperry attended a micrographics seminar which was presented by Freeman Dyke, a nationally recognized authority on information handling and management. He came away feeling that there were procedures in our office that would benefit from COM immediately, especially our Administrative Study List file. We decided to try it. Within two weeks we set up our first COM file, active records of nearly 19,000 students. Since then the Office of Admissions and Records at UWM has not had a hard-copy file of these Study Lists.

As a result of widespread interest in our use of COM, Sperry prepared a slide-tape report which describes the use of COM as a daily operational system at our institution. We now will show you the slide-tape.



HOW COM?

At the University of Wisconsin-Milwaukee, we have been using microfilm as a means of record insurance for about four years. During this time we have been developing a records management system in which our goals have been 1) to reduce the volume of our hard-copy files, 2) to establish a means for efficient record retrieval, and 3) to use this system for transcript production. As a by-product of our work, we found microforms to be a useful, everyday resource for routine records work. We therefore conditioned ourselves to accept microforms for more widespread applications than for fire protection and space saving.

In September 1969 we became seriously interested in a new form of computer output called computer output microfilm or COM. COM is a process where computer developed magnetic tape data is converted via electronic equipment into human readable language onto microfilm. To make the microform image look like hard-copy an overlay slide can be used which allows constant data to be superimposed with the variable computer information during the conversion run.

We will present to you some of the history of our experience with Computer Output Microfilm and how it has evolved in the past two years. We believe that COM affords a means for records management that merits the attention and consideration both of users of data processing output and of data processing managers.

In instituting the use of Computer Output Microfilm we focused on our administrative study list file. In its hard-copy form this file consists of one computer produced tab card for each of our 21,000 students enrolled in the University. The study list contains biographical and academic data about the student, including his schedule of courses for the current semester, the time and location of the courses and which courses were added or dropped since the original registration. In addition to social security number, the study list also contains the student's classification, year, advisor, major, residence and entry status, sex and marital status, employer, number of hours worked, birthdate, local and permanent address, telephone, whom to notify in case of emergency, and date of update.

We regarded our experience with COM produced study lists in the Office of Admissions & Records as experimental. On the one hand, we wanted to maintain the type of information, both in quantity and quality, that we had previously maintained. At the same time, we hoped to be able to make our handling and use of it more economical. In this way, we hoped to attract the interests of other campus users. The Office of Student Affairs agreed to participate in our experiment.

The seven trays containing the complete administrative study list file was thereby reduced to four rolls of 16 mm film using a 24 to 1 reduction ratio. Subsequently, we learned that by using a thinner 16 mm film we could get the entire file on two rolls. This was a

great advantage to us because it meant less changing of rolls for looking up data.

In the Office of Student Affairs, our experiment met with immediate approval from the secretarial staff. The information contained on the study list was now available on the first day of classes instead of the third or fourth week as had been the case with the hard-copy study list. The file became much more accessible, especially for answering telephone inquiries. The task of interfiling updates was eliminated since the entire file is updated on microfilm biweekly. We were not quite so satisfied in the Records Office, primarily because the number of inquiries made the initial output of four rolls of film too cumbersome and slow in the equipment we had available. The changeover to thinner film improved matters in the Office of Admissions & Records. We felt, however, that it would be necessary to increase the number of microfilm readers before the Records Office use would be satisfactory.

After a few weeks 16 mm roll film at 24 to 1 reduction ratio did not seem to be the microform output we should try to market to other parts of the campus. Following a number of conferences with microfilm representatives, we learned that other COM microform techniques were available or were about to become available. The techniques suggested to us were:

- higher reduction ratios,
- the use of a step-and-repeat camera,
- transferring two 16 mm rolls onto a 35 mm roll,

-- and skinny film.

However, roll readers for these higher magnifications with COM size screens were either not available or were priced way beyond our limited budget.

In November 1969 we became acquainted with COM produced microfiche and decided to try it. Fiche is a French word meaning "card". COM produced microfiche is 105 mm film that is automatically or manually cut into 6 inch strips so that the end result is a 4 inch by 6 inch sheet of film. Each of these 4" x 6" sheets of film contains 208 11" x 14" frames of data using a 42 to 1 reduction ratio. In order to economize we put the records of three students on each frame so that each COM produced fiche contains 621 student records plus an index retrieval frame. Our entire administrative study list file of 21,000 students is contained on 34 of the 4" x 6" fiche.

COM microfiche has several advantages over 16 mm or 35 mm roll film. A reader for fiche with high magnification and a COM size screen costs less than a 16 mm or 35 mm roll reader with these qualities. By using more than one reader, several people can use one fiche file simultaneously, unless they have a need for the same fiche. Moreover each individual document can be located faster on a fiche reader compared to a motorized roll reader.

Our fiche are indexed and titled by computer. The user first selects the fiche in the alpha or numeric sequence he needs, in the same way he uses a card file. He then looks at the index frame which is located at the lower right corner of each fiche. From the index frame, an X-Y reference guide on the reader provides him with extremely rapid, accurate retrieval.

Our tests of COM fiche were promisingly satisfactory. The COM produced microfiche plus low cost readers seemed to be the system to install around campus. The Office of Admissions & Records was now able to satisfy the demands from the various University offices for accurate, timely student information. In the past only a limited number of copies of data were available without incurring additional computer print runs or employing reproduction facilities which were costly and further delayed the availability of data. COM allowed us to supply computer information to a greater number of users at a decreasing cost rate.

In December 1969 we acquired sixteen COM fiche readers with 42 X magnification. Six readers were placed in various areas of the Office of Admissions & Records. Eight readers were placed in six of our large colleges. One reader each was placed in the Office of Student Affairs and the University Health Center. Our Student Loans Office who was constantly using the hard-copy study list file in the Records Office immediately purchased a COM Reader and requested microfiche service. We continued to supply our small colleges hard-copy study list output. However, most of these colleges have since purchased their own readers and now receive study list information only on fiche. The number of campus users continues to grow. At the present time we have 39 COM Fiche Readers on campus, 35 of which are using our administrative study lists on fiche.

When compared to hard-copy, magnetic tape onto microfiche via a service organization is quite reasonable in cost. Based on our annual volume of frames, which we estimate to be over 400,000 this year, our cost for the original set of study lists on microfiche for one update using a service organization is \$94.50 which includes pickup and delivery charges. Duplicate sets of study lists on microfiche cost \$3.74. Our total cost for one update using a service organization is \$221.66 which includes 35 sets of study lists on microfiche for the entire student body of 21 M. To provide these 35 sets of study lists for the entire student body in hard-copy would cost \$1617 in materials alone. Add to this the cost of bursting, decollating, computer print time, forms spoilage, inventory space and storage files.

Our Office of Admissions & Records is a primary user of data processing. This office also serves several secondary users -- mostly academic deans' offices. Admissions & Records inputs data it receives from the deans and other sources in addition to the data it develops in its various functions. Computer output, especially hard-copy output in the form of student study lists, grade reports, and student academic records, is essential to Admissions & Records, and to the deans' offices. The deans are thus secondary users, their need being largely concerned with reports of their own students.

In deciding to use COM instead of hard-copy, we in Admissions & Records kept our responsibility to these secondary users very

much in mind. Initially the deans objected to our proposal that we provide the complete student file to each office. Registrars in other universities, or primary users who serve other users within any organization, may have to meet similar objections convincingly if they want to use COM to replace hard-copy output.

We found the deans' secretarial and clerical assistants to be our strong allies. They saw immediately that the complete student file would benefit their work. We had informed the deans that their offices frequently needed data about students in other academic units, especially those seeking intra-campus transfer and those taking courses in other units. The deans acknowledged some such use but were not convinced until we asked them to consult their subordinates. We were gratified to find that each complete COM student file of the administrative student study list results in an average savings of two man hours a week. In the near future we are planning to provide partial student files via COM for each dean in addition to the complete student file.

This one application of COM at UWM has had measurably good results as follows: 1) wide distribution of a high use information file, leading to convenient access to data and resulting in better service; 2) better use of personnel; 3) both real and relative savings in cost of the information file; and 4) stimulus to further use of microforms.

The key to our successful use of COM was not these benefits, however, even though COM use would not survive without them. The

key was in overcoming mental sets. Administrators in education have been conditioned to think in terms of the computer. They are willing to buy processors, tape drives, disc packs, printers, and forms. They have not been conditioned to think "microfilm" in terms of data processing. We have found that colleagues in records offices and computer centers in other universities have a similar mental set. They think "computer", and up to now microfilm is something else, even if it is produced via computer.

Even so, these colleagues and other primary users of data processing are subject to the fundamental concerns of their responsibility; 1) how to meet pressing needs for processing and distributing data; and 2) how to do it most economically. We are convinced that COM will help us meet these concerns in other applications we will institute in the future.

We will use COM instead of a computer terminal in virtually all locations where retrieval and display of information is the primary function. Microfilm data is "real time" information so long as it is accurate, current, and usable for decision-making. We update our computer file every week. Even during periods when the volume of file change is greatest, the effect of pending and unprocessed changes of data is both scattered and non-critical. Decisions can be made about a student even if his file is not up to the minute. We want each record to be accurate and current, and if it contains an error or is not complete, we expect to correct it promptly. For

virtually all of our work a COM file will serve as well as a terminal at about 1/30 the cost. This is not to belittle computer terminals. We expect to use them -- but not where COM files can do the job.

In the Office of Admissions & Records we have other COM output. Since our study list file is in Social Security Number order, we have a COM produced name/number reference which lists alphabetically the names, social security numbers, and other personal data on our 21,000 students. One line of biographical data is provided for each student. This name/number reference consists of four microfiche. On a semi-annual basis we are planning to use COM for an alphabetic and numeric listing of the 80,000 names and social security numbers we have accumulated since 1963. We have eliminated one run of hard-copy grade reports and saved seven hours of computer print time and man-days of bursting and decollating by producing sets of final grade reports on fiche for some administrative users. Through the use of COM we hope to eliminate our permanent record hard-copy and update the cumulative record on film monthly, bimonthly, or whenever necessary.

COM has replaced hard-copy in other university offices. A faculty/staff directory has been produced on fiche primarily for the university switchboard and mailroom. All of our COM users receive a copy of this fiche directory. An accounts payable ledger for the Union, Housing, and Bookstore is being produced in COM fiche

form. Our Student Loans Office will put its 6,000 loan ledgers on fiche in the near future.

COM provides a means of making better use of computer facilities by providing more manageable data output that also leads to benefits for other users--all at less cost than other types of output. The examples and rationale of this discussion have been based on our experience with COM produced through a service organization. We have been pleased with this experience, so much so that we see little need to think of acquiring COM processing equipment.

The main reason for discussing this facet of COM here is that many educational users of data processing have come to distrust and resist commercial service organizations. There have been at least two disadvantages: lack of mutual understanding, and cumbersome access. College personnel sometimes do not understand data processing well enough to use a service operated by personnel who do not understand college functions. Even when this problem is overcome it is not easy to carry input data and output forms back and forth, often at odd hours for the user. We can state categorically that we have had excellent service from commercial COM service organizations.

To conclude: as a major primary user of data processing, we find COM to be a means for high benefit, low cost improvement of computer use. COM simplifies output distribution and records management, and does so with high potential for dollar savings

in methods and cost of production, and in use of the product. We believe that other college and university users can realize similar results.

Beginning/Expanding A Microfilm System

Up to this section of our theme, our emphasis has been on microfilm for active uses, some of which we have related to data processing. As we have stated, however, our original purposes for developing a microfilm system in our University were file security and space reduction. These purposes continue to be important to the overall benefit of a microfilm system. In fact, one or the other may be your primary reason for adopting some microfilm system.

Both security and space-saving are byproducts of COM. The records manager who need not be concerned for inactive records and who enjoys full potential of an adequate data processing shop can elect to change from hard-copy to COM. In the change he can initiate measures that will protect his now and future film, and at the same time benefit from space saving and freedom from paper handling. Example: The permanent academic records of students in the University of _____ are input to and maintained in machine modes. With this capability, the Registrar and Data Processing Manager at _____ both have a microfilm option. The Registrar can choose to ask for microform computer output for records management procedures, especially those other than transcripts and final grade reports. And he can use this output for a record security file. If his old records are already microfilmed, or if he can afford to risk them, he will

never need to film them. Each update of his COM file brings him closer to file security. Meanwhile he need not add to his inactive hard-copy file, and eventually he or his successor can move it all to archives. The Data Processing Manager can use microfilm for storing machine language data (up to 250,000 bytes per frame), saving at least 90% of the space magnetic tape required, with no danger of degaussing or other hazards of tape storage.

Most records managers will have to make more complicated choices, choices affected by the variables of records to be filmed, reasons for filming them, and kinds of approaches to film. In the rest of this section, we will discuss some of these variables, relative to some of the principles of microfilming.

The strongest argument to support a microfilm system is security. Reduction of records volume via film makes it possible to duplicate a file so that a copy may be stored in a safe place. While microfilming for security alone may be an expensive investment, to return to normal business after a fire or other kind of trashing may require many times the cost, with no assurance of as good results as with microfilm. Any benefits other than security will, of course, improve the cost-benefit ratio. Thus the first principle in deciding on a microfilm system is that it be designed for the most effective uses.

Before considering a system and equipment to support it, the records manager should make a general policy decision: what record

or records should be filmed, and for what purposes. In Milwaukee we film hard-copy records for two general purposes:

- retention and retrieval, primarily of the students' permanent academic record (PRC) originating in our University. We do not film high school or previous college transcripts because they originate in other institutions.
- expedient file security, of paperwork in progress. This use supports some of our procedures and might not apply to other records offices.

Another preliminary is to make a descriptive inventory of records subject to filming.

- What size or sizes are your records?
- Is data entered in pen and ink, typewriter, on labels, etc?
- What is the condition of the record stock? Colored paper? Brittle? Clear or yellowed?
- How many of each kind of record?

In making the inventory, collect a representative sample of all kinds of your records. You will need them to test cameras.

Again, before talking to a salesman or inspecting any equipment, you should decide on your priorities. We know of some records offices that began microfilming old records first. We advocate the opposite, especially if you want the benefit of security. The most vulnerable records in your office are the ones you need to

open up for business tomorrow. Procedures for microfilming your active student records after grades are posted each semester will provide security that can enable you to keep your office going. In contrast, the older, more inactive the record, the less real need for it is likely to develop. Of course, when you have everything filmed, you will be ready for the deluge of requests you will get, if you have a fire, from people anxious to know whether their records were destroyed.

Now, with your records inventory under control, your purposes established and priorities decided, you may be ready to look at systems. And now is the time to keep in mind at least two other principles of microfilming:

- the principle of more work than you expect. Preparation of a file for filming should be thorough and accurate. It will take time. But preparation plus filming may be less than half of the work. The index, especially if you use any rapid retrieval system, requires the most work.

This is another reason why regular microfilming of active records merits first priority. You can use data processing to index the file.

- the principle of files: a microfilm file is more complex than if it were merely a miniature hard-copy file.

This has implications for your choice of microform.

COM is produced on roll film - 16 mm, 35 mm, and 105 mm. We recommend the 105 mm film which formats images 'step and repeat', as we have shown to you. Other microforms can be produced from photo-processed film. Three of these are subject to the principle of more work:

Aperture Cards. These have the appeal of being machine processable, for indexing, for file purging, and for other file management needs. Some types can be easily and economically duplicated. Aperture cards are excellent for engineering drawings.

They are not so economical for academic records. No matter whether the film is inserted or integral to the card, it requires more work than other forms.

Film Jackets. Requires much file maintenance--more records handling than hard-copy. It can be indexed and handled easily, but it is a pack-rat approach to records retention.

Microfiche (stripped up). 16 mm film is cemented to plastic card which can then be readily duplicated. Stripping requires skillful, precise work which may be worthwhile if several copies of the file are desired. Original fiche can be economically duplicated, and fiche readers are cheaper than roll film.

16 mm roll film has until recently been the most useful microform for academic records. Cameras, readers, and retrieval systems are available from several reputable sources. 35 mm film offers no

advantage for most applications, and is generally more expensive to process and use. 16 mm film may continue to be a good microform for academic records, especially for small schools and colleges, or for limited applications. As commercial users move to 105 mm microforms, good reconditioned 16 mm equipment has become available cheap.

105 mm step and repeat microform produced photographically provides a way to complement COM microfiche. Equipment about to become available makes step and repeat microform attractive to large institutions with a large volume of old records to be filmed.

In this discussion we have frequently alluded to indexing. An index is essential for rapid file retrieval, so the more active the file the greater the need for an index. The converse is also true. An inactive file may need minimal indexing. In Milwaukee we divide our inactive file, using the terms 'old inactive' and 'recent' inactive. Initially we planned to index the entire microfilm file for image count retrieval. By analyzing our transcript production, which includes transcripts of reentering student records, we found that the incidence of demand for inactive records decreases sharply after five years. We thus decided to film old inactive records without an image index. We keep the file in alpha order and index it by roll of film: Aaron to Adams on roll 1, Adamy to Agar on 2, etc. It is far less costly to spend a minute or two extra retrieving a record from this file than to create and main-

tain an image index for it.

For our active and recent inactive records we use a punch-card index. In the near future we will convert it from hard-copy to COM fiche. As the 'old inactive' file ages, so that the 'recent inactive' file gradually becomes the old, our index will also gradually include every record in the file -- without the considerable cost of starting up a complete image index.

In considering a roll film or microfiche system, one question most often raised is "What do you do with the old microfilm image when you re-activate a record?" Well, you use it to keep the rest of the file in one piece. It doesn't take up much room and if you cut it out you will have to put in a splice. Be sure to update your index to show where the updated record is.

We will conclude this section with a sort of operational principle of microforms -

- the principle of change: you are no more likely to conceive and implement an ultimate system of micro-filming than of other office procedures. This has implications about equipment you may decide on now and later, and on whether to buy or lease. We recommend that you do not commit yourself to one system or one brand of equipment.

The Now-Potential of Microfilm *

Home Use

The possibility of microfilm goes beyond the office -- into education and the home. In their 1970 Christmas Catalog Neiman-Marcus of Dallas offered a microfilm and portable viewer system for the home, promising to liberate housewives from the tedium of keeping receipts on index cards and personal finance files in shoe boxes. Neiman-Marcus specializes in way out suggestions. We think that this one will soon change from glamorous product to staple.

Teaching Aid

Through the cooperation of a number of microfilm manufacturers a third grade class in Barrington, New Hampshire is using microforms in place of hard-copy text books. The experiment is still in progress but already school officials feel that microfilm has proven to be an excellent method for motivating the hyperactive child. Early indications from the third graders is that they are delighted with microfilm. The children are working with 16 mm and 35 mm rolls and cartridges, fiche, negative and positive film, color, and black and white film, and manual and motorized readers.

Publications

We are moving toward an era of paperless publishing. With a 142% proposed increase in second class mail over the next five years and with the nation's paper supply dwindling, more magazines and newspapers will be forced into bankruptcy. Of the publications remaining, there will be a gradual replacement of hard-copy with microfilm.

Film will fly faster and cheaper first class than paper plodding along second class.

Freeman Dyke, Jr., a nationally recognized authority on information handling and management, stated recently that within the next year a company will give, to one hundred thousand families whose income is twenty-five thousand dollars or more, a microfilm reader plus the ability to purchase magazines and other publications on film. Eric T. Hansen, Production Manager of the Fort Worth Star-Telegram indicated that newspapers will find their greatest opportunities in such media as microfiche, television cassettes, and electronic delivery in the next five or ten years.

Libraries

Libraries of the future will be libraries of fiche or ultrafiche. (Ultra fiche like COM fiche is produced on sheets with a reduction ratio of between 100 and 400.) It will cost less to give books on fiche to library users than to have the fiche returned and refiled. The average cost of putting a new book into use above and beyond the cost of the book itself is \$23. The printed encyclopedia which is quickly obsolete because new knowledge comes so fast will be available to libraries and home users in the near future. The 20,000 volumes of the Library of American Civilization has been reduced to 20,000 3" x 5" ultrafiche and is currently available to libraries. Over 100 college and universities have ordered this collection. Cost for the 20,000 volumes on ultrafiche will be \$1 per volume or \$20,000 for the 20,000 ultrafiche. This collection represents 6½ million pages of primary

source material.

Color Microfilm

Color Microfilm is available for conventional microfilming. It costs $2\frac{1}{2}$ to 3 times more than black and white microfilm. We have experimented with 16 mm color microfilm in connection with our Polaroid ID System. If our Regents had required a file of duplicate photos, we would have kept the duplicates on color microfilm. We had planned to use an inexpensive desk top planetary camera which would have fit easily into our ID production line. The microfilming would have taken place after the die cutting step in our ID procedure. The photo input card would have been used to record the roll and image number since filming was done at random and our roll retrieval is by means of the image count system. In the event a particular photo was needed in hard-copy form in the future for some purpose, we were prepared to take a color picture of the image displayed on the microfilm viewer. This would have been accomplished by using a hooded CU 5 Polaroid Camera costing about \$250.

We foresee color microfiche making giant strides in education. For example, at the completion of a slide/tape presentation, it would be possible for an instructor to provide each student with a copy of all the slides shown in the form of a 4 x 6 inch color microfiche. This would permit the student to review the presentation later at his convenience.

This entire presentation of 120 slides that we used for this

session could be put on two color microfiche at a duplication cost of 50¢ per fiche.

Data Retrieval

Most of you who work with microfilm are familiar with the methods of retrieving data from roll film. Systems such as Miracode, Image Count, Code Line, and so on can be found in many of our offices. In the future we are going to see fewer roll systems installed. In the last six months the demand for roll microfilm equipment has dropped 25%. (The rapid switching from roll film to fiche has presented an unusual purchasing opportunity for those of you who need roll/cartridge viewers. Name brand readers and reader/printers completely reconditioned are now available at a 66% savings.)

Let us look at the airline industry and the costly lesson they learned about data retrieval a few years ago. This is a good example of the computer being oversold to management. The airlines were constantly upgrading their computer equipment and purchasing banks of computer terminals in order to keep all of its reference available in a large data base. They found that it was impractical and expensive to keep large files on-line.

Today a number of the airlines have reduced their on-line data bases by putting relatively static information such as schedules, fares, hotel information, and car rental data on fiche and using high speed fiche retrieval devices.

A number of manufacturers produced these fiche retrieval units.

One of these units allows you to store up to 75,000 microfilmed pages of information at your fingertips on a desk top space of less than four square feet. What's more, any of the 75,000 pages is no more than four seconds away from viewing. A binary coding bar is attached to the fiche before loading into the retrieval unit.

High Speed Fiche Retrieval is becoming quite common in large banks and savings and loan associations for signature verification. This type of device can store items that a computer can't such as photos, maps, and drawings.

One manufacturer has introduced a microfiche reader which doubles as a computer terminal. The unit can handle any fiche format for automatic retrieval without coding.

The R. A. Morgan Company has announced an updateable microfilm terminal which is described as an "almost-real-time" retrieval system for 105 mm microfiche in roll form. It is designed primarily for COM applications. The standard data base is 90,000 pages of information on 200 feet of microfiche, and the standard retrieval time for a single image is less than three seconds. Two features make this device particularly attractive: the updating capability, and the price. Individual or multiple images on the microfiche roll can be automatically updated by plugging in a cartridge of 16 mm film with the images assigned the same numerical code as the images they replace. The price for the complete console terminal is \$5200.

105 mm Step & Repeat Conventional Camera

We have discussed 105 mm microfilm as it relates to COM. The latest innovation in conventional microfilm is the system designed around a 105 mm Step & Repeat Camera. A step-and-repeat camera is normally used to produce microfiche. The camera looks at a page of a document, exposes a frame or section of film and then automatically proceeds to the next frame as a new document is filmed. The 105 mm step-and-repeat camera is designed to enable office personnel to produce professional quality microfiche.

A 105 mm step-and-repeat fiche camera/processor has just been introduced by the Microfilm Technology Corporation of California which can be operated in a normal office environment by untrained personnel. All operations are automatic and there is no requirement for external plumbing or outside processing. The manufacturer claims that a completed microfiche can be produced in less than 120 seconds. This camera/processor reportedly sells for \$9500.

Another manufacturer has just announced a complete microfiche production system for just under \$16,000. The system includes a 105 mm step-and-repeat camera, film processor, film cutter, microfiche titling easel, microfiche duplicator, Diazo film processor, microfiche reader, beginning supplies, and installation supervision, operation and maintenance training not to exceed one week.

The 105 mm Step-and-Repeat Conventional Camera will have considerable impact on college and university records management. We will see more conventional microfiche systems using the 105 mm camera installed

in the future. We plan to make use of a 105 mm camera for our active permanent record file until we have our cumulative permanent record in the computer.

Composing Reduction Printer

About now you are probably saying to yourself--all these innovations are fine but I'm committed to 16 mm or 35 mm roll film at a 20 to 1 reduction ratio. Well, it seems that Kodak has developed a sophisticated piece of hardware which can produce almost any microform output -- including full-formed fiche -- from good quality 16 mm or 35 mm roll film input. In addition, the reduction ratio of the original can be magnified up to three times. In other words if your current microfilm system is 16 mm roll film at a 20 to 1 reduction ratio, you could convert to 16 mm roll, 35 mm roll, or 105 mm fiche at a 20, 40, or 60 reduction ratio by passing the original film through this device.

One reader manufacturer is producing a unit with a zoom lens to take care of the wide range of magnifications.

Computer Input Microfilm (CIM)

We have discussed COM's role in relieving the output bottleneck of the computer. Now let us turn our attention to computer input. Many of us have third generation computers that process up to 95,000 characters per second. However, our input to these super computers in most instances is punched cards which have an input rate of approximately 800 cards per minute. Other methods of input such as direct

entry to tape remote terminals, and optical scanning are being used but each has its limitations and disadvantages.

Most optical character readers on the market today are limited in what they can accomplish due to problems in printed and typed material. Most OCR readers can only read double spaced, modified type font material prepared on high quality specially prepared forms. They can read only numbers and upper case alphabetic characters and cannot read special symbols or characters. Having to transport paper to the OCR unit and the jamming of paper while feeding the reader are other disadvantages of OCR. Computer Input Microfilm units are optical character readers that scan microfilm rather than paper. After the microfilm is scanned, the data is digitized and then a general purpose computer and recognition equipment converts the data into machine language. CIM units can read any typewriter font and can learn special characters or symbols and new type fonts in a matter of minutes. CIM units handle paper of all sizes and all qualities.

Compuscan, one of the two manufacturers of CIM units is currently converting a large number of original patents for the Commerce Department. The complete set of patents is said to contain over 100 billion characters.

Information International is the manufacturer of a CIM unit called Grafix I. This device is a fourth-generation optical data input system that reads computer input data from documents of any size or format, printed in any font, in any language. This is a data input system

that uses film in the same sense that magnetic tapes and discs are used as input media.

Linked to a computer output microfilmer the Grafix I could slash the time and expense of book and periodical production . . . and all but provide books on demand. Imagine turning over your typed catalog copy to your computer center and returning later that day to receive proof copies -- formatted, justified and in the desired type font -- run from COM produced film through, for example, a Xerox Copyflo.

Both Computer Input Microfilm units that I mentioned will permit all campus typists to prepare student data for use in a data bank. CIM conversion prices range between 20¢ and \$1.50 per thousand characters depending on the source documents.

SUMMARY

At the University of Wisconsin-Milwaukee we believe that microfilm and micrographics can be used to facilitate all records procedures from admissions to archives. We have begun to use microfilm to replace some paper records altogether. We foresee the time when microfilm will replace virtually all other paper records, and when we will use admissions forms primarily as input to data processing--via microfilm. In these uses of microfilm--in admissions, in registration and current records, in generating a permanent academic record and keeping it updated, in transcripts, and finally in inactive records--we will realize the benefits of space-saving and record security as a valuable by-product.

This is what we mean by the dynamics of microfilm. We believe that many a college or university can and will move to these new uses of this century old tool that up to quite recently has been used primarily to store and safeguard inactive records. You will be making dynamic use of micrographics

- when you use microfilm as a means for current information distribution;
- when you use microfilm as a safeguard for active procedures so that fire or riot will hardly slow you down, not to speak of putting you out of business;
- when you use microfilm for improving records procedures in your own offices;

- when you use microfilm greatly to reduce or eliminate hard-copy computer output (with attendant savings in forms inventories, deleafing, bursting, and distribution), hard-copy record retention (with attendant savings in files, file space, file systems, and file security);
- when you use microfilm as input to data processing for your student data base, for course and section requests in registration, for final grades, and for all record changes (name, address, classification, major, advisor, grade, etc.);
- when you use microfilm to retain machine language data ready for on-demand input back into the computer.

COMPUTER OUTPUT MICROFILM AND ITS POTENTIAL IMPACT ON A
DATA PROCESSING MANAGER

Robert P. Schmidt
Director
Administrative Data Processing

Many data processing managers today are faced with problems like - their computer is too busy to get everything done, even scheduling 24 hours a day, 7 days a week. Users are requesting faster response from data processing so that they in turn may respond more quickly to the problems facing them. Rate of change is accelerating and data processing systems must be able to accommodate change. And all of this must be done on a tighter budget and in a management environment which recognizes that information, like any other resource, must be managed effectively. Finally, that same tightening of the purse strings that data processing is experiencing is affecting all parts of the institution and more people are looking to data processing as a means for holding the line on or reducing cost.

Computer Output Microfilm (COM) does offer some answers to the problems facing the data processing manager. The COM process introduces microforms as a cost effective alternative for displaying information to users. Hard-copy printout has remained the primary method of outputting information even though computers themselves change dramatically every year. The primary

benefit of COM for the data processing manager is replacement of hard-copy printout. First, expensive continuous forms and the about equal costs of handling operations like bursting and decollating can be eliminated. Second, elimination of additional (perhaps all) print passes for a report can increase thruput dramatically and make time available for new and expanding functions. Data can be written out on magnetic tape for COM conversion at 10 to 100 times the speed of the faster line printers. Third, response to users will not be degraded and perhaps can be improved because COM Service Bureaus regularly provide 12-24 hour turn-around. Post-printing operations like decollating, bursting and binding often require at least 24 hours turn-around for the large volume printed reports that COM is an appropriate replacement for. Fourth, customizing a COM report involves purchase of a forms overlay slide (approximately \$150) with a 10-14 day lead time. Custom printed forms require significant lead time and often represent a heavy investment that may have to be scrapped.

A second benefit is that COM is likely to be a lower cost alternative than on-line terminals for inquiry only applications into files updated daily or less frequently. An acceptable microform reader can be purchased for the equivalent of several months rental of a CRT terminal. Retrieval from a microform file can be just as fast as in a tele-communications network. Perhaps most

importantly, the high cost of the CPU, main memory, and disk storage expansion usually required for on-line processing can be avoided or postponed until data collection and file update go on-line.

ALPHA SEQ	NAME	CLASS & YEAR	RES	SEX	CES	TERM	STUDENT NUMBER	DATE OF BIRTH
0763	BERGMANO, MICHAEL C.	PBBA 1	1	3	4	19	802-01-6833	2-29-49
ADVISOR OR MAJOR PROFESSOR		MAJOR		EMPLOYER AND HOURS WORKED PER WEEK				GRADUATION
L & S GEN. STAFF		ACCOUNTING		UWM				15
CURRICULAR AREA	COURSE	CREDITS	CLASS	DAYS	HOURS	BUILDING & ROOM	LOCAL	
BUS ADM	202	3	DS 8	F	10:30-12:20	BOL 281		
COMMUN	103	3	SE 3	M W F	9:30	MER 320		
ECON	201	3	DS 9	F	8:30	BOL 276		
9 **							HOME	
							839-0307	
							155 N.W. Midway Blvd.	
							Milwaukee, Wisconsin	
							EMERGENCY NOTIFICATION	
							(FATHER)	
							Mr. John C. Bergmano	
							same address	

ALPHA SEQ	NAME	CLASS & YEAR	RES	SEX	CES	TERM	STUDENT NUMBER	DATE OF BIRTH
1102	CARTWRIGHT, PAMELA M.	ELED 4	1	1	4	19	388-22-0520	10-33-51
ADVISOR OR MAJOR PROFESSOR		MAJOR		EMPLOYER AND HOURS WORKED PER WEEK				GRADUATION
KUNKLE, ETHEL		EL.ED.NUR.KIND. 1-3		GIMBELS				12 BS 3
CURRICULAR AREA	COURSE	CREDITS	CLASS	DAYS	HOURS	BUILDING & ROOM	LOCAL	
DANCE	101	3	LC A	W	10:30	MIT 240D	Sandberg Hall	
ENGLISH	208	3	DS 9	F	11:30	FAM 150A	Room N 1608	
ENGLISH	208	3	DS 10	F	1:30	GAR 327D	HOME	
HISTORY	202	3	DS 38	F	12:30	BOL 292	112-9013	
POL SC	104	3	LC A	M W F	8:30	BOL 40	901 Parkway Avenue	
PSYCH	205	3	LC A	T Th	12:30-1:45	MER 130A	Champion, Wisconsin	
18 **							EMERGENCY NOTIFICATION	
							(MOTHER)	
							Mrs. Anne Cartwright	
							same address	

ALPHA SEQ	NAME	CLASS & YEAR	RES	SEX	CES	TERM	STUDENT NUMBER	DATE OF BIRTH
5019	PANTELLI, EDWIN H.	ED 5	1	2	4	21	399-22-0520	1/ 1/48
ADVISOR OR MAJOR PROFESSOR		MAJOR		EMPLOYER AND HOURS WORKED PER WEEK				GRADUATION
EDUCATION UNKNOWN		CURRIC & INSTRUCTION		MENOM FALLS PUB SCH 40				
CURRICULAR AREA	COURSE	CREDITS	CLASS	DAYS	HOURS	BUILDING & ROOM	LOCAL	
ED PHILO	500	3	SE 1	T	6:30-9:10 P.M.	MER 25		
3 **							HOME	
							886-0311	
							1600 Bramhill Rd.	
							Sturtevant, Wisconsin	
							EMERGENCY NOTIFICATION	
							(MOTHER)	
							Mrs. J. Pantelli	

the University of Wisconsin
— Milwaukee
GRADE REPORT
Form UWM OAR 202

DEPARTMENT	COURSE NO.	DESCRIPTIVE TITLE	CREDITS	GRADE	POINTS	EARNED
						SEMESTER A, B, C, D, F POINTS
ADVISER OR MAJOR PROFESSOR			PREVIOUS ACADEMIC ACTION			BLOCK A, B, C, D, F POINTS
MAJOR OR OPTION			DEAN'S ACTION OR COMMENT — THIS REPORT			CUMULATIVE POINTS DEFICIT
CLASS AND YEAR			ACTION BASIS UNIV. OF WIS. CREDITS	SEMESTER ALL GRADES	GRADING BLOCK	CUMULATIVE A, B, C, D, F
TERM			GRADE POINT AVERAGE			DEFERRED LOW POINTS

the University of Wisconsin
— Milwaukee
GRADE REPORT
Form UWM OAR 202

DEPARTMENT	COURSE NO.	DESCRIPTIVE TITLE	CREDITS	GRADE	POINTS	EARNED
						SEMESTER A, B, C, D, F POINTS
ADVISER OR MAJOR PROFESSOR			PREVIOUS ACADEMIC ACTION			BLOCK A, B, C, D, F POINTS
MAJOR OR OPTION			DEAN'S ACTION OR COMMENT — THIS REPORT			CUMULATIVE POINTS DEFICIT
CLASS AND YEAR			ACTION BASIS UNIV. OF WIS. CREDITS	SEMESTER ALL GRADES	GRADING BLOCK	CUMULATIVE A, B, C, D, F
TERM			GRADE POINT AVERAGE			DEFERRED LOW POINTS

the University of Wisconsin
— Milwaukee
GRADE REPORT
Form UWM OAR 202

DEPARTMENT	COURSE NO.	DESCRIPTIVE TITLE	CREDITS	GRADE	POINTS	EARNED
						SEMESTER A, B, C, D, F POINTS
ADVISER OR MAJOR PROFESSOR			PREVIOUS ACADEMIC ACTION			BLOCK A, B, C, D, F POINTS
MAJOR OR OPTION			DEAN'S ACTION OR COMMENT — THIS REPORT			CUMULATIVE POINTS DEFICIT
CLASS AND YEAR			ACTION BASIS UNIV. OF WIS. CREDITS	SEMESTER ALL GRADES	GRADING BLOCK	CUMULATIVE A, B, C, D, F
TERM			GRADE POINT AVERAGE			DEFERRED LOW POINTS